Phytoplankton Productivity Experiments and Nutrient Measurements in Bedford Basin, Nova Scotia, from January 1977 to July 1977

B. Irwin and T. Platt

Marine Ecology Laboratory
Bedford Institute of Oceanography
Fisheries and Marine Service
Department of Fisheries and the Environment
Dartmouth, Nova Scotia
B2Y 4A2

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Fisheries and Marine Service

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September 1978

PHYTOPLANKTON PRODUCTIVITY EXPERIMENTS AND NUTRIENT MEASUREMENTS IN BEDFORD BASIN, NOVA SCOTIA, FROM JANUARY 1977 TO JULY 1977

B. Irwin and T. Platt

Marine Ecology Laboratory

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ABSTRACT

Irwin, B. and T. Platt. 1978. Phytoplankton productivity experiments and nutrient measurements in Bedford Basin, Nova Scotia, from January 1977 to July 1977. Fish. Mar. Serv. Data Rep. No. 93: 26 pp.

A series of primary production incubation experiments and related nutrient determinations were made from Bedford Basin (63°38'30"W 44°41'30"N) over the period January 1977 to July 1977. In this report we make available the raw data and the fitted light saturation parameters with confidence limits.

RÉSUMÉ

Irwin, B. and T. Platt. 1978. Phytoplankton productivity experiments and nutrient measurements in Bedford Basin, Nova Scotia, from January 1977 to July 1977. Fish. Mar. Serv. Data Rep. No. 93: 26 pp.

Durant la période du janvier 1977 à juillet 1977, des séries d'expériences sur la détermination de la production primaire et des sels nutritifs furent réalisées de Bedford Basin (63°38'30"W 44°41'30"N). Dans le présent rapport nous présentons les données brutes sur ces expériences; ainsi que les paramètres avec leur intervalles de confiance qui furent calculés pour représenter les courbes de production en fonction de la lumière.

INTRODUCTION

This is the third in a series of data reports giving results of photosynthetic production versus light intensity for natural phytoplankton populations of Nova Scotia coastal waters. The present report is a continuation of the work described in Irwin and Platt (1978)

Bedford Basin is a small (17 km^2) deep (70 m) marine basin separated from the Atlantic Ocean by a long channel, Halifax Harbour (10 km long, sill depth 20 m). This basin receives the untreated industrial and domestic sewage effluent from an urban community of approximately 50,000 people.

We present in this report the results of experiments, together with the fitted parameters and their confidence intervals to the light saturation curves.

METHODS

Productivity

The C^{14} method as given in Strickland and Parsons (1972) was used. Twenty light and two dark bottles were innoculated with 1 ml of sodium bicarbonate C^{14} having an approximate activity of 5 uci. The exact activity of the solution was determined by counting 10 µl aliquots in a scintillation counter. The innoculated bottles were placed in temperature controlled incubators and illuminated for 4 hours by a 150 watt floodlight (GTE Sylvania PAR 150).

At the end of the 4 hour incubation, the samples were filtered immediately onto 2.5 cm 0.45 µ pore size membrane filters. The filters were dried in a dessicator, exposed to HCl fumes for 10 minutes and counted in a scintillation counter.

Chlorophyll a

Replicate samples were filtered onto glass fibre. The fluorometric method of Yentsch and Menzel (1963) as modified by Holm-Hansen et al. (1965) was used. The fluorometer was calibrated with solutions of pure chlorophyll a.

Particulate carbon and nitrogen

Replicate samples were filtered onto previously baked silver filters (0.8 µ pore size). The filters were combusted in a Hewlett Packard Model 185 B CHN analyser.

Light intensity

Total radiation in each compartment of the incubators was measured with an Eppley 40 Junction pyranometer. Light quality was measured with an ISCO spectroradiometer.

Cell counts

An aliquot of raw sea water from each sample was counted for cell numbers and total cell volume using a model T Coulter counter.

Nutrients

Five inorganic nutrient concentrations were routinely measured for each sample. They were nitrate, nitrite, ammonia, phosphate and silicate and were measured using the following colorometric techniques:

1) Nitrate - the sum of nitrate plus nitrite by reducing the nitrate to nitrite using the cadmium amalgam method described in Strickland and Parsons (1972).

2) Nitrite - the method as described in Strickland and Parsons (1972).

3) Ammonia - the phenolhypochlorite method as described by Solorzano (1969).

4) Phosphate - the method described by Murphy and Riley (1962).

5) Silicate - the method described by Mullin and Riley (1955).

Light saturation parameters

Production rates were normalized to unit chlorophyll and plotted against light intensity. Three parameters were calculated (Platt et al. 1975; Jassby and Platt 1976):

1) the initial slope, α , of the linear portion of the plot.

2) the respiration, R^B , the intercept of the linear portion of the y-axis of the plot.

3) the assimilation number, P_m^B , by a non-linear least squares fit of the function $P^B = P_m^B \tanh(\alpha I / P_m^B) - R^B$ to the entire data set for a given sample.

ACKNOWLEDGEMENTS

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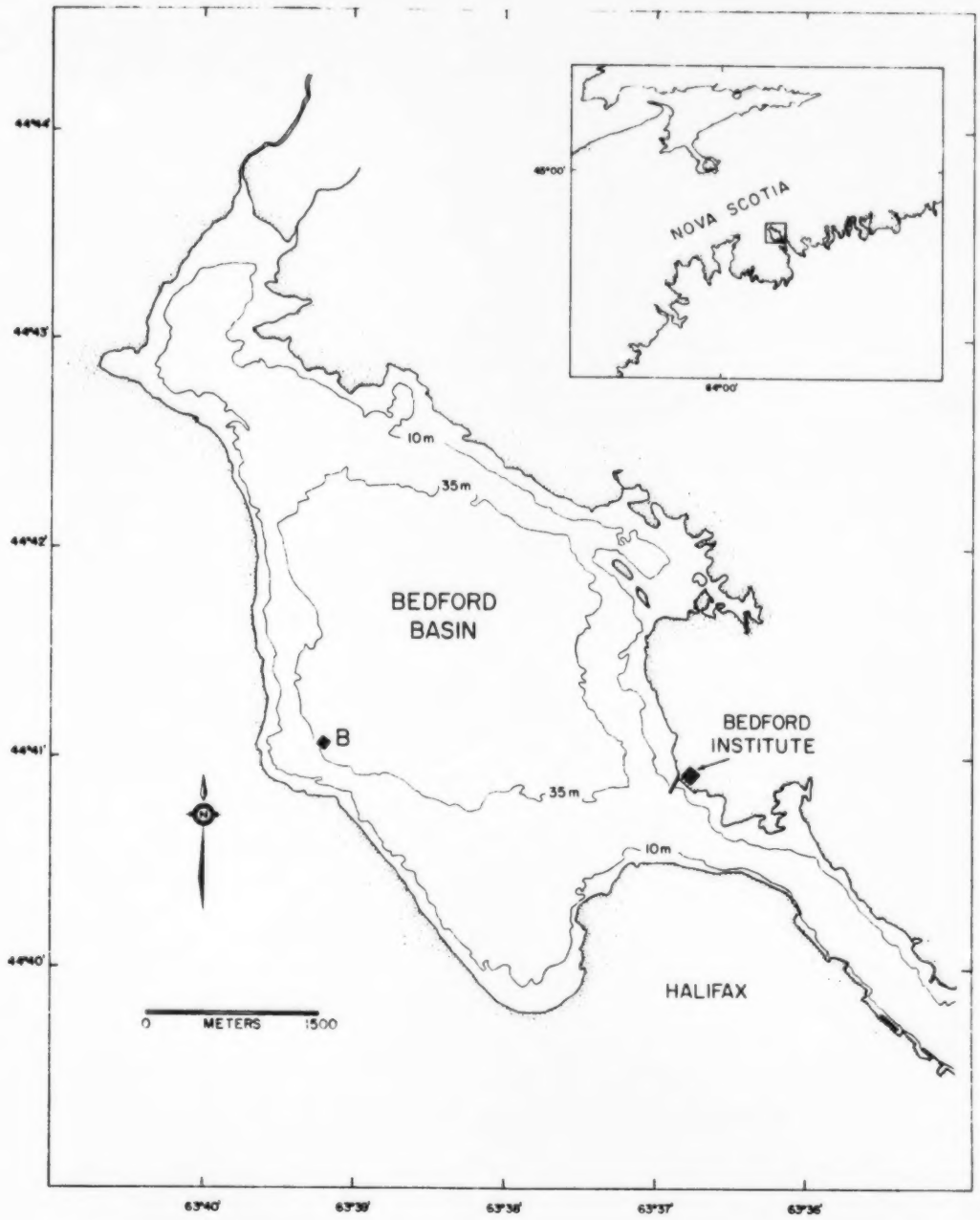

Fig. 1. Station location in Bedford Basin.

LIGHT SATURATION AND NUTRIENT TABLES

BEDFORD BASIN

44°41'N 63°39'W

DATE: 04/01/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 0.0°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
221.7	4.62	180.4	4.41
73.5	4.33	57.9	4.41
34.0	3.96	24.3	3.96
17.7	3.63	13.5	4.00
11.2	2.31	7.6	2.60
5.6	1.90	3.8	1.77
3.8	1.36	2.1	0.74
2.6	0.91	1.2	0.33
1.5	0.58	0.7	0.25
0.9	0.29	0.4	0.16

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Incubation Temperature: 2.0°C

	mg at m^{-3}
Nitrate:	8.83
Nitrite:	0.12
Ammonia:	1.52
Silicate:	13.26
Phosphate:	1.17

	mg m^{-3}
Chlorophyll:	0.24
Carbon:	99
Nitrogen:	21

Salinity: 29.406 °/₀₀

Total number of cells:	3.2	x $10^6 l^{-1}$
Total volume of cells:	1.24	ppm
Mean volume of cells:	400	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.35	0.30	0.40
B^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.01	-0.09	0.07
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	4.32	4.09	4.55

44°41'N 63°39'W

DATE: 11/01/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.6°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$
221.7	6.14	180.4	4.75
73.5	5.18	57.9	4.86
34.0	3.89	24.3	5.07
17.7	4.25	13.5	2.96
11.2	2.79	7.6	1.86
5.6	1.82	3.8	1.07
3.8	1.25	2.1	0.64
2.6	0.75	1.2	0.36
1.5	0.46	0.7	0.18
0.9	0.21	0.4	0.07

Incubation Temperature: 2.0°C

	mg at m^{-3}
Nitrate:	7.49
Nitrite:	0.13
Ammonia:	1.54
Silicate:	10.07
Phosphate:	1.07

	mg m^{-3}
Chlorophyll:	0.28
Carbon:	96
Nitrogen:	15
Salinity:	30.411 °/₀₀

Total number of cells:	2.2	x $10^6 l^{-1}$
Total volume of cells:	1.43	ppm
Mean volume of cells:	600	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$$hr^{-1}$(W m^{-2})$^{-1}$	0.27	0.24	0.31
x^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	0.04	-0.09	0.16
P_m^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	4.88	4.56	5.20

BEDFORD BASIN

44°41'N 63°39'W

DATE: 18/01/77

SAMPLE DEPTH: 5 m

SURFACE TEMP: 0.3°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
221.7	2.66	180.4	3.77
73.5	2.87	57.9	2.51
34.0	2.68	24.3	2.50
17.7	2.19	3.8	0.70
11.2	1.53	2.1	0.82
5.6	1.16	1.2	1.45
3.8	0.80	0.7	1.73
0.9	0.15	0.4	0.46

Incubation Temperature: 0.7°C

	mg at m^{-3}
Nitrate:	7.92
Nitrite:	0.15
Ammonia:	1.40
Silicate:	11.10
Phosphate:	1.03

	mg m^{-3}
Chlorophyll:	0.61
Carbon:	167
Nitrogen:	23

Salinity: 30.248 °/₀₀

Total number of cells:	3.5 x $10^6 l^{-1}$
Total volume of cells:	0.86 ppm
Mean volume of cells:	250 μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}$(W m^{-2})$^{-1}$	0.22	0.20	0.23
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	- 0.04	-0.11	0.04
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	2.71	2.46	2.98

44°41'N 63°39'W

DATE: 25/01/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 0.8°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$
207.7	2.59	158.9	2.85
88.4	2.51	58.3	2.72
32.3	2.53	20.0	2.38
15.5	1.81	9.3	1.64
9.0	1.29	4.9	1.15
5.1	0.96	2.7	0.54
3.3	0.79	1.3	0.34
2.2	0.69	0.8	0.16
1.4	0.64	0.4	0.15
1.0	0.24	0.3	0.03

Incubation Temperature: 0.9°C

	mg at m^{-3}
Nitrate:	7.30
Nitrite:	0.16
Ammonia:	1.24
Silicate:	10.38
Phosphate:	1.06

	mg m^{-3}
Chlorophyll:	1.17
Carbon:	191
Nitrogen:	31

Salinity: 30.502 °/₀₀

Total number of cells:	4.7	x $10^6 l^{-1}$
Total volume of cells:	1.21	ppm
Mean volume of cells:	250	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$$hr^{-1}$(W m^{-2})$^{-1}$	0.23	0.15	0.32
B^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	0.05	-0.09	0.20
P_m^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	2.51	2.34	2.67

BEDFORD BASIN

44°41'N 63°39'W

DATE: 08/02/77

SAMPLE DEPTH: 5 m

SURFACE TEMP: 0.6°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
168.5	3.51	133.6	3.28
82.2	3.04	49.7	3.05
35.2	2.95	26.3	2.38
15.5	2.53	14.5	1.65
9.5	1.03	8.4	1.11
5.7	0.92	4.9	0.55
4.0	0.64	3.2	0.30
2.8	0.31	2.2	0.14
2.1	0.18	1.8	0.04
1.7	0.09	1.6	0.04

Incubation Temperature: 0.7°C

	mg at m^{-3}
Nitrate:	7.79
Nitrite:	0.13
Ammonia:	1.44
Silicate:	9.88
Phosphate:	1.05

	mg m^{-3}
Chlorophyll:	0.74
Carbon:	185
Nitrogen:	33

Salinity: 30.467 °/₀₀

Total number of cells:	5.5	x $10^6 l^{-1}$
Total volume of cells:	1.26	ppm
Mean volume of cells:	250	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.20	0.16	0.23
R^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.27	-0.38	-0.16
P_m^B mg C(mg Chl a)$^{-1}hr^{-1}$	3.39	3.19	3.60

44°41'N 63°39'W

DATE: 15/02/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.1°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$
175.9	2.88	175.4	2.84
67.7	2.61	59.4	2.82
28.8	2.65	27.3	2.24
14.7	1.35	13.7	1.45
8.3	1.10	7.9	0.88
5.9	0.66	5.1	0.49
3.7	0.44	3.0	0.25
3.0	0.25	2.3	0.09
2.3	0.11	1.7	0.04
1.8	0.05	1.5	0.01

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Incubation Temperature: 1.2°C

	mg at m^{-3}
Nitrate:	9.45
Nitrite:	0.19
Ammonia:	1.08
Silicate:	11.28
Phosphate:	1.12

	mg m^{-3}
Chlorophyll:	1.10
Carbon:	138
Nitrogen:	23

Salinity: 30.774 °/₀₀

Total number of cells:	4.1	x $10^6 l^{-1}$
Total volume of cells:	2.01	ppm
Mean volume of cells:	500	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$$hr^{-1}$(W m^{-2})$^{-1}$	0.15	0.13	0.17
P^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	-0.22	-0.28	-0.16
P^B_m mg C(mg Chl a)$^{-1}$$hr^{-1}$	3.00	2.89	3.11

BEDFORD BASIN

44°41'N 63°39'W

DATE: 22/02/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.0°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
166.0	3.11	173.8	3.00
78.9	2.71	78.2	3.07
33.4	2.88	37.9	2.57
12.6	1.76	16.1	1.99
8.0	0.95	10.2	1.22
4.8	0.47	5.4	0.76
2.9	0.32	3.2	0.46
1.5	0.16	2.4	0.29
0.9	0.06	1.6	0.16
0.5	0.03	1.0	0.08

Incubation Temperature: 1.0°C

	mg at m^{-3}
Nitrate:	8.37
Nitrite:	0.16
Ammonia:	1.02
Silicate:	10.10
Phosphate:	1.02

	mg m^{-3}
Chlorophyll:	2.60
Carbon:	227
Nitrogen:	31

Salinity: 30.581 °/₀₀

Total number of cells: - x $10^6 l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.13	0.11	0.14
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.03	-0.09	0.27
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	3.02	2.89	3.15

BEDFORD BASIN

44°41'N 63°39'W

DATE: 01/03/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 0.8°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
124.7	2.16	128.3	2.34
48.6	2.10	54.0	2.26
20.7	1.77	18.1	1.94
13.8	1.03	11.8	1.33
7.9	0.67	8.0	0.78
5.4	0.38	5.2	0.52
3.7	0.25	3.7	0.21
2.8	0.15	2.7	0.11
2.3	0.08	1.9	0.05
1.7	0.04	1.4	0.03

Incubation Temperature: 1.5°C

	mg at m^{-3}
Nitrate:	6.98
Nitrite:	0.16
Ammonia:	1.01
Silicate:	9.47
Phosphate:	0.84

	mg m^{-3}
Chlorophyll:	7.34
Carbon:	334
Nitrogen:	59

Salinity: 29.746 °/₀₀

Total number of cells:	13.1	x $10^6 l^{-1}$
Total volume of cells:	3.30	ppm
Mean volume of cells:	250	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.11	0.10	0.12
R^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.17	-0.22	-0.12
P_m^B mg C(mg Chl a)$^{-1}hr^{-1}$	2.44	2.30	2.59

BEDFORD BASIN

44°41'N 63°39'W

DATE: 08/03/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.0°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
121.4	2.83	109.9	2.94
49.4	2.85	55.5	2.94
17.2	2.45	18.1	2.63
11.5	1.59	11.2	1.95
7.7	0.94	7.6	1.13
5.0	0.54	5.1	0.70
3.6	0.33	3.6	0.29
3.0	0.18	2.6	0.17
2.4	0.11	1.9	0.07
1.9	0.05	1.6	0.04

Incubation Temperature: 1.3°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	2.41	Chlorophyll:	14.35
Nitrite:	0.07	Carbon:	568
Ammonia:	0.87	Nitrogen:	95
Silicate:	5.84		
Phosphate:	0.48	Salinity:	29.998 °/₀₀

Total number of cells:	9.8	x $10^6 \ell^{-1}$
Total volume of cells:	5.65	ppm
Mean volume of cells:	600	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.17	0.16	0.19
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.29	-0.36	-0.21
P_m mg C(mg Chl a)$^{-1}hr^{-1}$	3.27	3.08	3.46

44°41'N 63°39'W

DATE: 15/03/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 3.1°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
117.4	2.97	104.2	3.13
53.0	2.84	43.4	3.15
18.1	2.68	14.5	3.03
12.1	1.86	9.4	2.24
7.8	1.12	6.8	1.31
5.0	0.65	4.3	0.83
3.9	0.42	3.2	0.32
3.0	0.24	2.3	0.17
2.2	0.12	1.7	0.07
1.8	0.07	1.5	0.03

Incubation Temperature: 1.9°C

	mg at m^{-3}
Nitrate:	0.39
Nitrite:	0.02
Ammonia:	0.59
Silicate:	1.25
Phosphate:	0.25

	mg m^{-3}
Chlorophyll:	12.01
Carbon:	721
Nitrogen:	92

Salinity: 28.337 °/₀₀

Total number of cells:	13.8	x $10^6 l^{-1}$
Total volume of cells:	7.28	ppm
Mean volume of cells:	500	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.21	0.17	0.24
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.30	-0.44	-0.16
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	3.44	3.15	3.74

BEDFORD BASIN

44°41'N 63°39'W

DATE: 22/03/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.9°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
131.4	2.94	144.4	2.86
58.5	2.88	43.8	2.90
20.1	2.61	17.6	2.31
13.1	1.81	12.9	1.60
8.8	1.11	8.8	1.09
5.8	0.71	6.0	0.69
4.3	0.40	4.5	0.31
3.3	0.26	3.5	0.20
2.4	0.15	2.6	0.10
2.1	0.09	1.8	0.05

Incubation Temperature: 2.0°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	0.75	Chlorophyll:	12.46
Nitrite:	0.10	Carbon:	690
Ammonia:	0.66	Nitrogen:	97
Silicate:	1.54		
Phosphate:	0.31	Salinity: 29.569	°/₀₀

Total number of cells:	9.7 x $10^6 l^{-1}$	
Total volume of cells:	7.26	ppm
Mean volume of cells:	750	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.15	0.14	0.17
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.26	-0.33	-0.20
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	3.26	3.10	3.43

BEDFORD BASIN

44°41'N 63°39'W

DATE: 29/03/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 2.5°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
120.9	3.30	120.3	3.16
51.9	3.21	54.4	3.25
16.6	2.83	23.0	3.07
10.9	2.01	11.8	1.83
7.2	1.25	7.4	1.06
4.3	0.77	4.2	0.61
3.2	0.42	2.5	0.34
2.2	0.26	1.6	0.18
1.4	0.14	1.2	0.09
1.2	0.08	1.0	0.04

Incubation Temperature: 2.5°C

	mg at m^{-3}
Nitrate:	0.14
Nitrite:	0.04
Ammonia:	0.31
Silicate:	0.73
Phosphate:	0.22

	mg m^{-3}
Chlorophyll:	14.52
Carbon:	715
Nitrogen:	92

Salinity: 29.730 °/₀₀

Total number of cells:	7.5	x 10^6 l^{-1}
Total volume of cells:	7.44	ppm
Mean volume of cells:	1000	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.18	0.16	0.19
K^B mg C(mg Chl a)$^{-1}$hr^{-1}	-0.11	-0.17	-0.05
P_m^B mg C(mg Chl a)$^{-1}$hr^{-1}	3.50	3.29	3.71

BEDFORD BASIN

44°41'N 63°39'W

DATE: 05/04/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 1.2°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
120.6	3.28	123.8	2.08
52.7	3.26	70.3	2.37
21.7	2.14	27.3	2.01
11.8	1.44	14.1	1.29
7.4	0.96	8.1	0.84
4.6	0.62	4.3	0.67
3.2	0.38	2.7	0.32
2.4	0.21	1.7	0.18
1.5	0.12	1.3	0.09
1.2	0.06	0.9	0.05

Incubation Temperature: 2.0°C

	mg at m^{-3}
Nitrate:	1.81
Nitrite:	0.10
Ammonia:	0.73
Silicate:	1.77
Phosphate:	0.47

	mg m^{-3}
Chlorophyll:	9.78
Carbon:	432
Nitrogen:	72

Salinity: 29.914 °/₀₀

Total number of cells: - x $10^6 l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.13	0.11	0.15
P^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.05	-0.12	0.02
P^B_m mg C(mg Chl a)$^{-1}hr^{-1}$	3.23	2.99	3.48

BEDFORD BASIN

44°41'N 63°39'W

DATE: 12/04/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 2.3°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
125.9	2.45	142.9	2.43
71.9	2.39	60.0	2.22
20.1	2.18	19.0	2.09
13.5	1.57	13.3	1.11
8.7	1.01	8.3	0.77
4.5	0.57	4.5	0.46
3.0	0.32	2.9	0.24
2.0	0.19	2.0	0.12
1.6	0.10	1.3	0.06
1.1	0.05	0.9	0.03

Incubation Temperature: 2.0°C

	mg at m^{-3}
Nitrate:	0.73
Nitrite:	0.10
Ammonia:	0.71
Silicate:	0.46
Phosphate:	0.42

	mg m^{-3}
Chlorophyll:	8.77
Carbon:	736
Nitrogen:	120

Salinity: 29.846 °/₀₀

Total number of cells: - x $10^6 l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.14	0.12	0.16
R^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.11	-0.16	-0.06
P_m^B mg C(mg Chl a)$^{-1}hr^{-1}$	2.53	2.40	2.66

BEDFORD BASIN

44°41'N 63°39'W

DATE: 20/04/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 3.4°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
180.1	3.26	141.3	3.41
83.6	2.78	68.1	2.85
34.2	2.54	28.0	2.67
19.7	1.90	14.8	1.54
10.9	1.28	8.3	0.89
6.3	0.76	4.8	0.51
4.3	0.43	3.1	0.26
3.0	0.24	2.2	0.13
2.6	0.11	1.4	0.04
1.2	0.08	0.8	0.02

Incubation Temperature: 3.3°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	1.69	Chlorophyll:	11.33
Nitrite:	0.15	Carbon:	771
Ammonia:	1.04	Nitrogen:	119
Silicate:	1.47		
Phosphate:	0.39	Salinity:	30.578 °/₀₀

Total number of cells: - x $10^{6}l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.12	0.11	0.13
P^B mg C(mg Chl a)$^{-1}$hr^{-1}	-0.10	-0.14	-0.07
P^B_m mg C(mg Chl a)$^{-1}$hr^{-1}	3.20	3.06	3.33

BEDFORD BASIN

44°41'N 63°39'W

DATE: 17/05/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 5.8°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
131.3	2.45	124.3	2.28
49.3	2.84	38.2	2.53
26.0	1.91	20.0	1.60
15.4	1.12	11.3	0.90
8.8	0.70	6.7	0.49
4.5	0.41	3.8	0.29
3.5	0.25	2.7	0.13
2.3	0.15	1.8	0.06
1.4	0.04	1.4	0.02
1.2	0.03	0.9	0.01

20

Incubation Temperature: 5.0°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	0.21	Chlorophyll:	7.58
Nitrite:	0.11	Carbon:	476
Ammonia:	0.75	Nitrogen:	68
Silicate:	0.80		
Phosphate:	0.45	Salinity:	30.203 ‰

Total number of cells: 5.8 x 10^{3} l^{-1}
Total volume of cells: 3.07 ppm
Mean volume of cells: 525 μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.08	0.08	0.09
B^{B} mg C(mg Chl a)$^{-1}$hr^{-1}	-0.07	-0.10	-0.05
P_s mg C(mg Chl a)$^{-1}$hr^{-1}	3.42	3.30	3.55

BEDFORD BASIN

44°41'N 63°39'W

DATE: 24/05/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 13.2°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
160.7	2.58	119.3	2.06
51.3	2.36	51.8	2.07
26.3	1.85	25.9	1.46
13.8	1.20	11.2	0.80
8.8	0.68	6.8	0.39
5.3	0.37	4.3	0.17
3.4	0.21	2.8	0.08
1.9	0.09	1.9	0.04
1.2	0.04	1.1	0.02
1.1	0.02	0.9	0.00

Incubation Temperature: 11.0°C

	mg at m^{-3}
Nitrate:	0.17
Nitrite:	0.12
Ammonia:	0.55
Silicate:	0.80
Phosphate:	0.42

	mg m^{-3}
Chlorophyll:	17.16
Carbon:	873
Nitrogen:	125

Salinity: 30.325 °/$_{oo}$

Total number of cells: - x $10^6 l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.08	0.07	0.09
R^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.08	-0.12	-0.05
P_m^n mg C(mg Chl a)$^{-1}hr^{-1}$	2.44	2.29	2.60

BEDFORD BASIN

44°41'N 63°39'W

DATE: 31/05/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 6.1°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$$hr^{-1}$
160.8	3.49	109.2	3.30
84.6	3.28	45.2	3.48
29.1	2.89	20.0	1.73
16.3	1.71	12.5	1.13
8.9	0.97	7.3	0.58
5.4	0.60	4.1	0.34
3.7	0.25	2.6	0.15
2.5	0.12	1.8	0.06
1.6	0.05	1.3	0.03
1.2	0.01	0.8	0.02

Incubation Temperature: 5.5°C

	mg at m^{-3}
Nitrate:	0.16
Nitrite:	0.09
Ammonia:	0.51
Silicate:	1.38
Phosphate:	0.56

	mg m^{-3}
Chlorophyll:	7.12
Carbon:	724
Nitrogen:	94

Salinity: 30.670 °/₀₀

Total number of cells: - x $10^6 l^{-1}$
Total volume of cells: - ppm
Mean volume of cells: - μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$$hr^{-1}$(W m^{-2})$^{-1}$	0.12	0.10	0.13
R^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	-0.13	-0.19	-0.08
P_m^B mg C(mg Chl a)$^{-1}$$hr^{-1}$	3.69	3.50	3.89

BEDFORD BASIN

44°41'N 63°39'W

DATE: 07/06/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 9.2°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
158.5	3.09	118.7	2.90
77.0	2.89	47.9	2.48
30.8	2.66	20.4	2.17
16.4	1.69	14.5	1.27
9.6	1.12	7.7	0.78
4.8	0.65	3.7	0.42
3.4	0.41	2.5	0.23
2.3	0.26	1.6	0.11
1.5	0.14	1.1	0.06
1.1	0.06	0.9	0.04

Incubation Temperature: 7.5°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	0.41	Chlorophyll:	5.80
Nitrite:	0.13	Carbon:	283
Ammonia:	0.52	Nitrogen:	45
Silicate:	2.41		
Phosphate:	0.40	Salinity: 29.486	°/₀₀

Total number of cells: 14.5 x $10^6 l^{-1}$
Total volume of cells: 2.19 ppm
Mean volume of cells: 150 μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.12	0.10	0.14
P^B mg C(mg Chl a)$^{-1}$hr^{-1}	-0.05	-0.11	0.01
P^B_m mg C(mg Chl a)$^{-1}$hr^{-1}	2.97	2.84	3.10

BEDFORD BASIN

44°41'N 63°39'W

DATE: 28/06/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 12.1°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
179.2	2.80	134.0	4.25
91.1	4.04	79.9	4.59
35.4	3.03	29.2	3.58
21.3	1.82	16.0	2.39
11.0	1.34	8.7	1.38
6.3	0.68	5.4	0.75
4.6	0.37	3.1	0.38
2.6	0.24	1.8	0.16
1.9	0.16	1.2	0.06
1.5	0.04	1.0	0.04

Incubation Temperature: 8.2°C

	mg at m^{-3}		mg m^{-3}
Nitrate:	0.73	Chlorophyll:	11.05
Nitrite:	0.05	Carbon:	545
Ammonia:	0.77	Nitrogen:	85
Silicate:	1.07		
Phosphate:	0.23	Salinity:	28.812 °/₀₀

Total number of cells:	30.1	x $10^6 l^{-1}$
Total volume of cells:	3.59	ppm
Mean volume of cells:	125	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.14	0.12	0.16
R^B mg C(mg Chl a)$^{-1}$hr^{-1}	-0.12	-0.23	-0.02
P_m^B mg C(mg Chl a)$^{-1}$hr^{-1}	4.38	4.07	4.71

BEDFORD BASIN

44°41'N 63°39'W

DATE: 05/07/77

SAMPLE DEPTH: 5 m

SURFACE TEMP: 14.5°C

Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$	Light Intensity $W\ m^{-2}$	Specific Production mg C(mg Chl a)$^{-1}hr^{-1}$
165.8	3.55	116.3	4.49
99.1	3.26	65.8	4.02
29.0	3.06	21.2	3.57
16.8	1.95	13.3	1.91
11.0	1.09	8.5	1.11
6.6	0.66	4.7	0.67
3.4	0.37	2.9	0.29
2.4	0.20	1.9	0.13
1.7	0.09	1.3	0.06
1.1	0.06	1.0	0.01

Incubation Temperature: 14.5°C

	mg at m^{-3}
Nitrate:	0.08
Nitrite:	0.07
Ammonia:	0.58
Silicate:	1.28
Phosphate:	0.38

	mg m^{-3}
Chlorophyll:	6.83
Carbon:	517
Nitrogen:	76

Salinity: 29.703 °/₀₀

Total number of cells:	22.6 x $10^6 l^{-1}$	
Total volume of cells:	4.20	ppm
Mean volume of cells:	175	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}hr^{-1}(W\ m^{-2})^{-1}$	0.12	0.10	0.14
R^B mg C(mg Chl a)$^{-1}hr^{-1}$	-0.07	-0.15	0.01
P_m^B mg C(mg Chl a)$^{-1}hr^{-1}$	4.60	4.05	5.19

BEDFORD BASIN

44°41'N 63°39'W

DATE: 12/07/77 SAMPLE DEPTH: 5 m SURFACE TEMP: 12.4°C

Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}	Light Intensity W m^{-2}	Specific Production mg C(mg Chl a)$^{-1}$hr^{-1}
165.8	6.70	116.3	7.54
99.1	6.90	65.8	7.89
29.0	5.03	21.2	4.96
16.8	2.76	13.3	3.18
11.0	1.58	8.5	1.77
6.6	0.91	4.7	1.01
3.4	0.32	2.9	0.40
2.4	0.12	1.9	0.10
1.7	0.06	1.3	0.12
1.1	0.05	1.0	0.08

Incubation Temperature: 13.6°C

	mg at m^{-3}
Nitrate:	0.25
Nitrite:	0.12
Ammonia:	0.55
Silicate:	3.04
Phosphate:	0.61

	mg m^{-3}
Chlorophyll:	1.24
Carbon:	247
Nitrogen:	37

Salinity: 30.469 °/$_{oo}$

Total number of cells:	6.0	x $10^6 l^{-1}$
Total volume of cells:	1.20	ppm
Mean volume of cells:	200	μ^3

		90% Confidence Interval lower	upper
α mg C(mg Chl a)$^{-1}$hr^{-1}(W m^{-2})$^{-1}$	0.18	0.15	0.21
R^B mg C(mg Chl a)$^{-1}$hr^{-1}	-0.16	-0.33	-0.00
P_m^B mg C(mg Chl a)$^{-1}$hr^{-1}	7.62	7.00	8.26